

CLAIMS

1. A vibrating push button station at which a tactile signal is produced, said vibrating push button station comprising:

a frame;

a flexible diaphragm mounted on said frame and having opposite outwardly and inwardly

5 facing sides;

a pushing surface to which a force is applied by a user, said pushing surface located on the outwardly facing side of said flexible diaphragm;

a magnet coupled to the inwardly facing side of said flexible diaphragm;

10 an electromagnetic assembly supported by said frame so as to lie below and in spaced alignment with said magnet; and

means to pulse said electromagnetic assembly and thereby generate a corresponding changing magnetic field so as to cause said magnet and said flexible diaphragm coupled thereto to move towards and away from said electromagnetic assembly, the movements of said magnet relative to said electromagnetic assembly being transmitted as a vibration to said pushing surface
15 at the outwardly facing side of said flexible diaphragm.

2. The vibrating push button station recited in Claim 1, wherein said pushing surface is a push button connected to the outwardly facing side of said flexible diaphragm, said vibration being transmitted to the hand of the user at said push button.

3. The vibrating push button station recited in Claim 1, wherein said electromagnetic assembly includes a coil to be pulsed so as to generate said changing magnetic field, said magnet

moving towards and away from said coil.

4. The vibrating push button station recited in Claim 3, wherein said electromagnetic assembly also includes a stationary coil housing supported by said frame so as to receive and retain said coil in spaced alignment below said magnet for producing said vibration at said pushing surface.

5. The vibrating push button station recited in Claim 4, further comprising a magnet holder attached to the inwardly facing side of said flexible diaphragm so as to receive said magnet, said magnet holder and said magnet therewithin moving towards and away from the coil within said stationary coil housing.

6. The vibrating push button station recited in Claim 5, further comprising a force sensitive device mounted on said stationary coil housing, said magnet holder moving towards said coil housing so as to apply a force to said force sensitive device and thereby cause said force sensitive device to supply a signal for causing the coil of said stationary coil housing to be pulsed and said
5 changing magnetic field to be generated.

7. The vibrating push button station recited in Claim 6, wherein said force sensitive device is a piezoelectric element and the signal supplied thereby is a voltage.

8. The vibrating push button station recited in Claim 7, wherein said piezoelectric element is located within a cavity formed in said stationary coil housing so as to lie in spaced axial

alignment with said magnet holder.

9. The vibrating push button station recited in Claim 8, including an elastomeric bumper mounted on said stationary coil housing outside the cavity within which said piezoelectric element is located, said bumper transmitting to said piezoelectric element the force applied by the user to the pushing surface of said flexible diaphragm for causing said magnet holder to move
5 towards and apply said force to said piezoelectric element.

10. The vibrating push button station recited in Claim 7, further comprising a circuit board electrically interconnected to said piezoelectric element to receive the voltage supplied by said piezoelectric element and produce a switching signal in response thereto, said switching signal being applied to said means to pulse the coil of said electromagnetic assembly, whereby said coil
5 is pulsed and said changing magnetic field is generated.

11. The vibrating push button station recited in Claim 1, wherein said frame has an open top, said flexible diaphragm extending across said open top to be suspended therefrom, said pushing surface and said magnet at the opposite facing sides of said diaphragm moving in unison relative to said frame towards said electromagnetic assembly in response to the force applied by the user
5 to said pushing surface.

12. A vibrating push button station to provide a tactile signal to a user, said vibrating push button station comprising:

a push button to which a pushing force is applied by the user;

10 a magnet coupled to said push button;

 a coil to which a current is applied to generate a changing magnetic field and thereby cause the magnet to move towards and away from said coil, the movements of said magnet towards and away from said coil being transmitted to said push button as said tactile signal; and

 a force sensitive element spaced from and aligned with said magnet, said magnet moving

15 towards said force sensitive element to apply a force thereto in response to the pushing force applied by the pedestrian to said push button, said force sensitive element generating an output signal when said magnet moves into contact therewith for causing the current to be applied to said coil.

13. The vibrating push button station recited in Claim 12, further comprising a flexible diaphragm having opposite first and second sides, said push button coupled to the first side of said flexible diaphragm and said magnet coupled to the second side of said flexible diaphragm, said flexible diaphragm flexing when said pushing force is applied by the pedestrian to said push

5 button for moving said magnet into contact with said force sensitive element.

14. The vibrating push button station recited in Claim 12, wherein said force sensitive element is a piezoelectric element and said output signal is a voltage generated by said piezoelectric element for causing the current to be applied to said coil when said magnet moves into contact with said piezoelectric element.

15. The vibrating push button station recited in Claim 14, further comprising a circuit board to receive the voltage generated by said piezoelectric element for causing the current to be

applied to said coil, said piezoelectric element electrically connected to and spaced from said circuit board by means of flexible electrical circuitry extending therebetween.

16. The vibrating push button station recited in Claim 12, further comprising a coil housing so as to receive and retain said coil in surrounding coaxial alignment with said magnet so that said magnet moves relative to said coil when said current is applied to said coil.